CLAIMS:

1. A fuel cell system comprising:

a fuel cell having an electrolyte, a cathode provided at one side of the electrolyte, an anode with a hydrogen permeable metal layer provided at the other side of the electrolyte, a cathode channel for supplying oxidizing gas to the cathode, an anode channel for supplying fuel gas containing hydrogen to the anode;

a hydrogen permeable metal layer degradation prevention section configured to reduce a partial pressure of hydrogen in the anode channel for preventing degradation of the hydrogen permeable metal layer;

a temperature parameter acquisition section configured to acquire a parameter relating to a temperature of the hydrogen permeable metal layer; and

a fuel cell controller for controlling an operation state of the fuel cell system, wherein the fuel cell controller has a degradation prevention mode for causing the hydrogen permeable metal layer degradation prevention section to operate when the temperature of the hydrogen permeable metal layer represented by the temperature parameter deviates from a predetermined temperature range.

2. A fuel cell system according to claim 1, wherein the hydrogen permeable metal layer degradation prevention section includes a gas supply reduction section configured to reduce a partial pressure of hydrogen in the anode channel by decreasing a supply of the fuel gas to the anode channel.

3. A fuel cell system according to claim 1, wherein the hydrogen permeable metal layer degradation prevention section includes:

a hydrogen separation device separating hydrogen in fuel gas; and

a hydrogen concentration reduction section configured to reduce a partial pressure of hydrogen in the anode channel by supplying fuel gas whose hydrogen concentration has been decreased by the hydrogen separation device to the anode channel.

4. A fuel cell system according to claim 3, wherein the hydrogen permeable metal layer degradation prevention section further comprising:

a gas supply reduction section for decreasing a partial pressure of hydrogen in the anode channel by decreasing a supply of the fuel gas to the anode channel; and

the fuel cell controller configured to cause the hydrogen concentration reduction section to operate when a temperature of the hydrogen permeable metal layer represented by the temperature parameter is below a predetermined lower temperature limit, and to cause the gas supply reduction section to operate when a temperature of the hydrogen permeable metal layer represented by the temperature parameter is above a predetermined upper temperature limit.

5. A fuel cell system according to claims 1 to 3, wherein the hydrogen permeable metal layer degradation prevention section includes a low hydrogen concentration gas supply section configured to decrease a partial pressure of hydrogen in the anode channel by supplying gas with a hydrogen concentration lower than the fuel gas to the anode channel.

6. A fuel cell system according to claims 1 to 5, further comprising:

a temperature increase facilitation section configured to facilitate a temperature increase in the hydrogen permeable metal layer; and

a temperature increase mode for causing the temperature increase facilitation section to operate when a temperature of the hydrogen permeable metal layer represented by the temperature parameter is below a lower temperature limit of the predetermined temperature range.

7. A fuel cell system according to claim 6, wherein

the fuel cell includes a heating channel, which is a gas channel for which an oxidizing catalyst is provided, and

the temperature increase facilitation section includes a hydrogen permeable metal layer heating section configured to heat the hydrogen permeable metal layer by supplying gas including a combustible component and a oxidizing component to the heating channel.

8. A fuel cell system according to claims 1 to 7, further comprising a temperature decrease facilitation section configured to facilitate a decrease in temperature of the hydrogen permeable metal layer, wherein

the fuel cell controller includes a temperature decrease mode for causing the temperature decrease facilitation section to operate when a temperature of the hydrogen permeable metal layer represented by the temperature parameter is above an upper temperature limit of the predetermined temperature range.

9. A fuel cell system according to claims 1 to 8, further comprising

a reformer generating fuel gas containing hydrogen from reforming material having hydrogen elements, wherein

the fuel cell controller causes the hydrogen permeable metal layer degradation prevention section to operate while maintaining operation of the reformer.

10. A fuel cell system comprising:

a fuel cell having an electrolyte, a cathode provided at one side of the electrolyte, an anode with a hydrogen permeable metal layer provided at the other side of the electrolyte, a cathode channel for supplying oxidizing gas to the cathode, an anode channel for supplying fuel gas containing hydrogen to the anode;

a hydrogen permeable metal layer degradation prevention section configured to prevent degradation of the hydrogen permeable metal layer by adjusting a temperature of gas supplied to the fuel cell;

a temperature parameter acquisition section configure to acquire a parameter relating to a temperature of the hydrogen permeable metal layer; and

a fuel cell controller for controlling an operation state of the fuel cell system, wherein the fuel cell controller has a degradation prevention mode for causing the hydrogen permeable metal layer prevention section to operate when a temperature of the hydrogen permeable metal layer represented by the temperature parameter deviates from a predetermined temperature range.

11. A fuel cell system according to claim 10, wherein

the hydrogen permeable metal layer degradation prevention

section includes a supply gas cooling section configured to cool gas supplied to the fuel cell, and

the fuel cell controller causes the supply gas cooling section to operate when a temperature of the hydrogen permeable metal layer is above a predetermined upper temperature limit.

12. A fuel system according to claim 10 or 11, wherein

the hydrogen permeable metal layer degradation prevention secion includes a supply gas heating section configured to heat gas supplied to the fuel cell, and

the fuel cell controller causes the supply gas heating section to operate when a temperature of the hydrogen permeable metal layer is below a predetermined lower temperature limit.

13. A fuel cell system comprising:

a fuel cell having an electrolyte, a cathode provided at one side of the electrolyte, an anode with a hydrogen permeable metal layer provided at the other side of the electrolyte, a cathode channel for supplying oxidizing gas to the cathode, an anode channel for supplying fuel gas containing hydrogen to the anode; and

a low temperature gas supply section for supplying gas whose temperature is lower than an operating temperature of the fuel cell to the fuel cell; wherein

the low temperature gas supply section includes a low temperature gas heating section configured to prevent degradation of the hydrogen permeable metal layer due to cooling by the low temperature gas by heating the gas within a range not reaching an operating temperature of

the fuel cell.

14. A fuel cell system according to claim 13, further comprising an auxiliary device whose temperature rises during operation of the fuel cell system, wherein

the low temperature gas heating section heats the low temperature gas by cooling the auxiliary device using the low temperature gas.

15. A fuel cell system according to claim 13 or claim 14, further comprising a high temperature gas supply section for supplying gas whose temperature is higher than an operating temperature of the fuel cell to the fuel cell, wherein

the high temperature gas supply section includes a high temperature gas cooling section configured to prevent degradation of the hydrogen permeable metal layer due to being heated with the high temperature gas by cooling the high temperature gas within a range not reaching an operating temperature of the fuel cell.

16. A fuel cell according to claim 15, further comprising a heat exchanger configure to exchange heat between the low temperature gas and the high temperature gas, wherein

the low temperature gas heating section heats the low temperature gas using the heat exchanger, and the high temperature gas cooling section cools the high temperature gas using the heat exchanger.